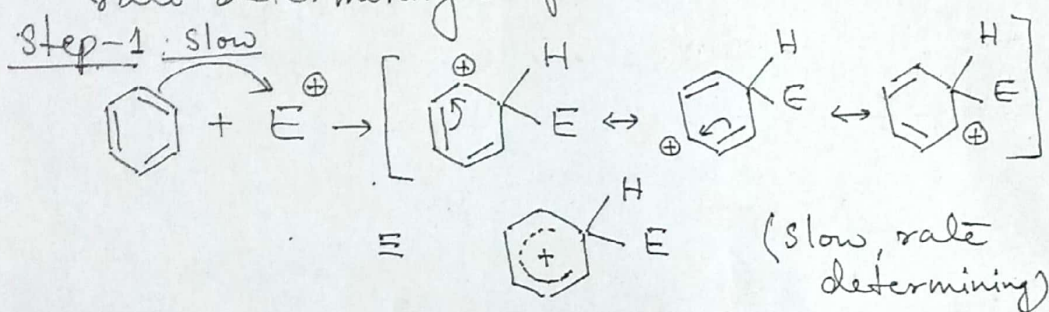


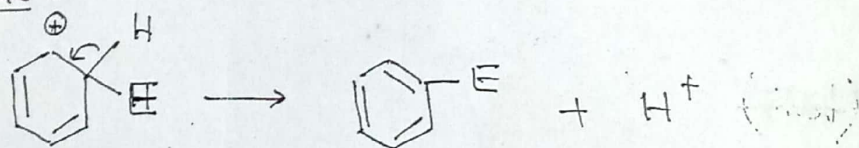
Role of sigma and pi complex in electrophilic substitution reaction.

During electrophilic substitution reaction a sigma bond is formed between the carbon atom of the aromatic ring and the electrophile. So formed intermediate is called sigma complex or Wheland intermediate.

Formation of this intermediate destroys the aromatic character of the ~~aromatic~~ ring. Therefore it is slow and hence it is the rate determining step.

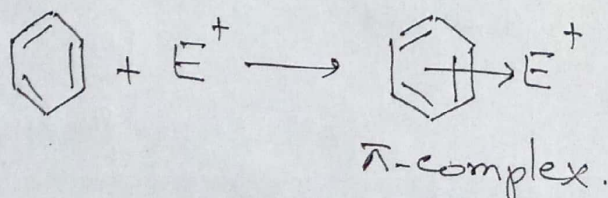


Step-2: Fast



Substitution product.

Experimental evidence suggested that the formation of σ -complex proceeds through the formation along with the formation of π -complex. Unlike σ -complex, π -complex does not involve actual bonding between the carbon atom of benzene ring and the electrophile but these are held together by only a weak electrostatic force of attraction.



From the experimental observations it has been concluded that as electrophile approaches the benzene ring it is attracted by the π -electron cloud to form a π -complex. subsequently, the π -complex removes a pair of electrons from the benzene nucleus and forms a covalent bond with one of the ring carbon atoms to form a σ -complex. This σ -complex then loses a proton which before departing from the product forms a π -complex. Thus, the complete picture of the mechanism of electrophilic substitution would be as follows:

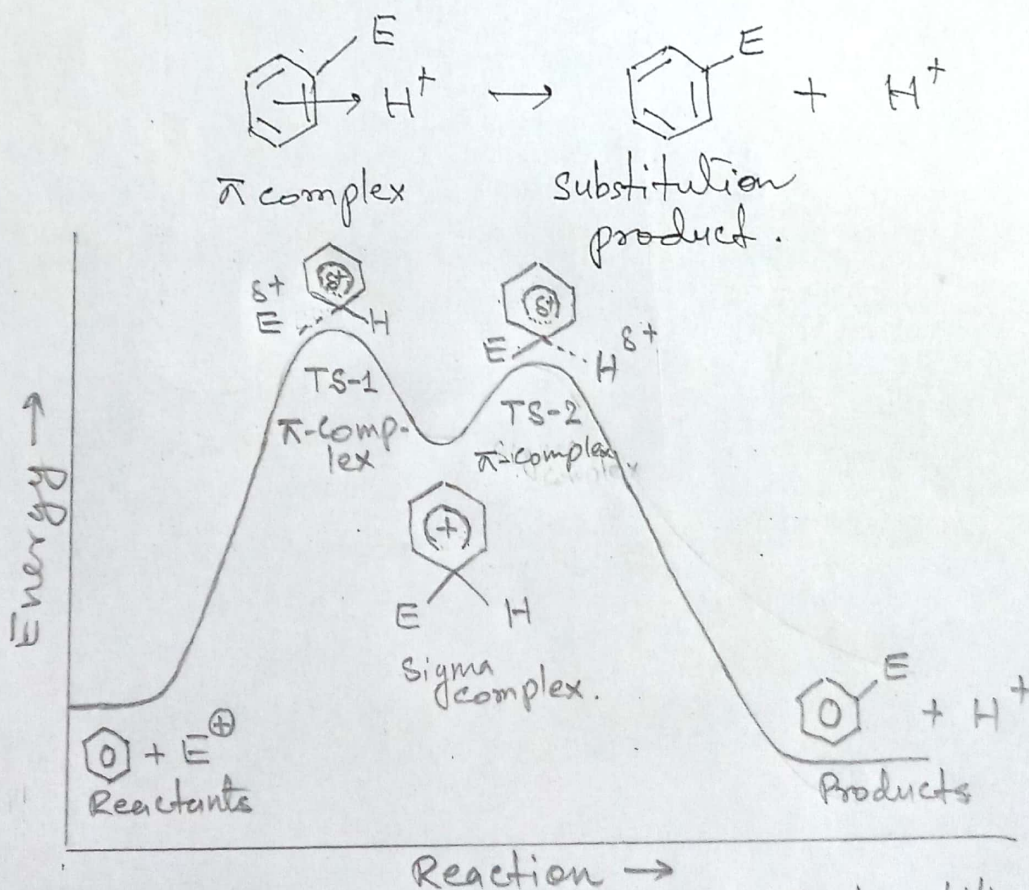
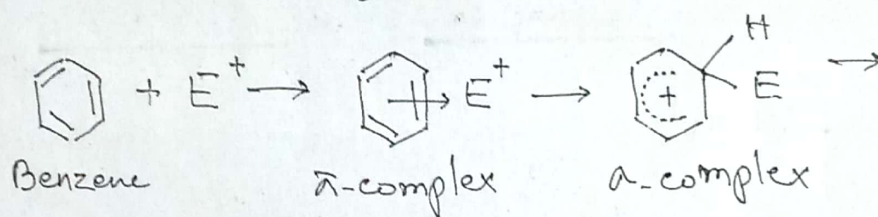


Fig:- Energy profile diagram of electrophilic substitution reaction.